

**Response**

Serial No.: 10/045,345

Confirmation No.: 1310

Filed: October 25, 2001

For: METHODS FOR FORMING ROUGH RUTHENIUM-CONTAINING LAYERS AND  
STRUCTURES/METHODS USING SAME**Remarks**

The Office Action mailed July 30, 2003 has been received and reviewed. No claims have been amended or cancelled. Therefore, claims 46-68 are pending in the present application. Reconsideration and withdrawal of the rejections are respectfully requested in view of the remarks herein.

**Information Disclosure Statements**

The Examiner acknowledged receipt of the Information Disclosure Statements filed, according to the Examiner, on February 15, 2002 and December 18, 2002. However, Applicants only received the return of an initialed page 4 of the PTO-1449 Form provided by the Applicants with the Information Disclosure Statement filed February 15, 2002 indicating that the references thereof have been considered. Applicants request the return of the other pages of the PTO-1449 Form filed on February 15, 2002 with the Examiner's initials indicating that the references listed in the Information Disclosure Statement filed February 15, 2002 have been considered.

Further, another Information Disclosure Statement was filed June 25, 2003. The PTO-1449 Form filed with this paper included one reference and has also not been initialed and returned.

Applicants request that the references listed in such Information Disclosure Statements be considered and the appropriate forms be initialed and return to the Applicant with the next office communication. To facilitate the review and return of the initialed 1449 forms, Applicant provides copies of the Information Disclosure Statements filed on February 15, 2002 and June 25, 2003.

**Double Patenting Rejection**

Claims 46-68 of the present application were provisionally rejected by the Examiner under 35 U.S.C. § 101 as claiming the same invention as that of claims 46-68 of co-pending U.S. Patent Application No. 10/042,025. Claims 46-68 of co-pending U.S. Patent Application No.

Page 3 of 4

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10/042,025 were cancelled in the "Request for Filing a Divisional Patent Application under Rule §1.53(b)" filed 25 October 2001. As such, this provisional rejection is overcome.

As there are no other rejections pending in the present application, the claims 46-68 are believed to be in allowable condition.

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Page 4 of 4

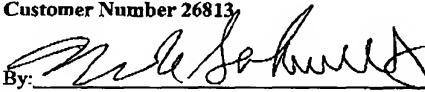
**Summary**

It is respectfully submitted that the pending claims 46-68 are in condition for allowance and notification to that effect is respectfully requested. The Examiner is invited to contact Applicants' Representatives, at the below-listed telephone number, if it is believed that prosecution of this application may be assisted thereby.

Respectfully submitted for  
Derderian et al.

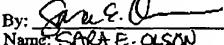
By  
Mucting, Raasch & Gebhardt, P.A.  
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Phone: (612) 305-1220  
Facsimile: (612) 305-1228  
Customer Number 26813

29 Oct 2003  
Date

By:   
Mark J. Gebhardt  
Reg. No. 35,518  
Direct Dial (612)305-1216

**CERTIFICATE UNDER 37 CFR §1.8:**

The undersigned hereby certifies that the Transmittal Letter and the paper(s), as described hereinabove, are being transmitted by facsimile in accordance with 37 CFR §1.6(d) to the Patent and Trademark Office, addressed to Assistant Commissioner for Patents, P.O. Box 1450, Alexandria, VA 22313-1450, on this 29th day of October, 2003, at 3:50pm (Central Time).

By:   
Name: SARA E. OLSON

**COPY**PATENT  
Docket No. 150.0088 0103

## IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

Applicant(s):	Derderian et al.	)	Group Art Unit:	Unknown
		)		
Serial No.:	10/045,345	)	Examiner:	Unknown
		)		
Filed:	25 October 2001	)		
		)		
For:	METHODS FOR FORMING ROUGH RUTHENIUM-CONTAINING LAYERS AND STRUCTURES/METHODS USING SAME			

INFORMATION DISCLOSURE STATEMENT

Assistant Commissioner for Patents  
Washington D.C. 20231

Sir:

In compliance with the duty imposed by 37 C.F.R. § 1.56, and in accordance with C.F.R. §§ 1.97 *et. seq.*, the materials enclosed herewith are brought to the attention of the Examiner as possibly being of interest in connection with the above-identified patent application. Consideration of each of the documents listed on the attached 1449 form(s) is respectfully requested. Pursuant to the provisions of M.P.E.P. §609, Applicants further request that a copy of the 1449 form(s), marked as being considered and initialed by the Examiner, be returned with the next Official Communication.

Applicants also wish to bring the Examiner's attention to the following pending U.S. Applications, as well as any prior art and any provisional U.S. patent applications referenced therein. A copy of each of the below-listed pending U.S. Patent Applications is provided herewith.

**Information Disclosure Statement**

Applicant: Derderian et al.

Serial No. 10/042,025

Filed: 25 October 2001

**METHODS FOR FORMING ROUGH RUTHENIUM-CONTAINING LAYERS AND STRUCTURES/METHODS  
USING SAME****List of Pending Non-Published U.S. Patent Applications**

Applicant(s)	Application Number	Filing Date	Serial No. of Provisional Application to which listed Application claims priority
Visokay	09/520,492	03/08/00	--
-	09/590,571	06/08/00	--
-	09/590,795	06/08/00	--
Derderian et al.	10/042,025	10/25/01	--

It is believed that no fee is due, as this Information Disclosure Statement is filed prior to the receipt of any Action on the merits. However, in the event a fee is due, please charge any fee or credit any overpayment to Account No. 13-4895.

The Examiner is invited to contact Applicants' Representatives at the below-listed telephone number, if they can be of any assistance during prosecution of the present application.

Respectfully submitted for

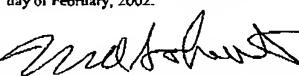
Micron Technology, Inc.

By

Muetting, Raasch & Gebhardt, P.A.  
P.O. Box 581415  
Minneapolis, MN 55458-1415  
Phone: (612)305-1220  
Facsimile: (612)305-1228  
Customer Number 26813

**CERTIFICATE UNDER 37 C.F.R. 1.8:**

The undersigned hereby certifies that this paper is being deposited in the United States Postal Service, as first class mail, in an envelope addressed to: Assistant Commissioner for Patents, Washington, D.C. 20231, on this 7th day of February, 2002.



Mark J. Gebhardt

Date

7 Feb 2 002

By:

  
Mark J. Gebhardt  
Reg. No. 35,518  
Direct Dial (612)305-1216

INFORMATION DISCLOSURE STATEMENT	Atty. Docket No.: 150.0088 0103	Serial No.: 10/045,345
	Applicant(s): Derderian et al.	Confirmation No.:
	Filing Date: 25 October 2001	Group: 2818

## U.S. PATENT DOCUMENTS

Examiner Initial	Copy Enclosed	Document Number	Date	Name	Class	Subclass	Filing Date If Appropriate
		5,068,199	11/26/91	Sandhu			
		5,130,172	07/14/92	Hicks et al.			
		5,130,885	07/14/92	Fazan et al.			
		5,314,727	05/24/94	McCormick et al.			
		5,318,920	06/07/94	Hayashide			
		5,342,800	08/30/94	Jun			
		5,352,488	10/04/94	Spencer et al.			
		5,372,849	12/13/94	McCormick et al.			
		5,372,962	12/13/94	Hirota et al.			
		5,392,189	02/21/95	Fazan et al.			
		5,427,974	06/27/95	Lur et al.			
		5,510,651	04/23/96	Maniar et al.			
		5,520,992	05/28/96	Douglas et al.			
		5,555,486	09/10/96	Kingon et al.			
		5,566,045	10/15/96	Summerfelt et al.			
		5,561,307	10/01/96	Mihara et al.			
		5,581,436	12/03/96	Summerfelt et al.			
		5,608,247	03/04/97	Brown			
		5,612,560	03/18/97	Chivukula et al.			
		5,696,014	12/09/97	Figura			
		5,763,633	06/09/98	Vaartstra			
		5,874,364	02/23/99	Nakabayashi et al.			
		5,877,063	03/02/99	Gilchrist			
		5,935,648	08/10/99	Roberson et al.			

EXAMINER	Date Considered
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\*Examiner: Initial if citation considered, whether or not citation is in conformance with MPEP 609; Draw line through citation if not in conformance and not considered. Include copy of this form with next communication to applicant.

INFORMATION DISCLOSURE STATEMENT	Atty. Docket No.: 150.0088 0103	Serial No.: 10/045,345
	Applicant(s): Derderian et al.	Confirmation No.:
	Filing Date: 25 October 2001	Group: 2818

Examiner Initial	Copy Enclosed	Document Number	Date	Name	Class	Subclass	Filing Date If Appropriate
		5,959,327	09/28/99	Sandhu et al.			
		5,962,065	10/05/99	Weimer et al.			
		5,962,716	10/05/99	Uhlenbrock et al.			
		5,980,983	11/09/99	Gordon			
		5,985,714	11/16/99	Sandhu et al.			
		5,990,559	11/23/99	Marsh			
		6,015,743	01/18/00	Zahurak et al.			
		6,037,220	03/14/00	Chien et al.			
		6,049,101	04/11/00	Graettinger et al.			
		6,060,367	05/09/00	Sze			
		6,060,351	05/09/00	Parekh et al.			
		6,063,705	05/16/00	Vaartstra			
		6,074,945	06/13/00	Vaartstra et al.			
		6,078,072	06/20/00	Okudaira et al.			
		6,114,557	09/05/00	Uhlenbrock et al.			
		6,133,159	10/17/00	Vaartstra			
		6,197,628	03/06/01	Vaartstra et al.			
X		6,281,125	08/28/01	Vaartstra et al.			

## FOREIGN PATENT DOCUMENTS

Examiner Initial	Copy Enclosed	Document Number	Date	Country	Class	Subclass	Translation Yes	Translation No
		JP 10163131	06/19/98	Japan (Abstract)				
		WO 00/22658 A	06/20/00	PCT				
X		WO 01/95376 A2	12/13/01	PCT				

## EXAMINER

## Date Considered

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INFORMATION DISCLOSURE STATEMENT	Atty. Docket No.: 150.0088 0103	Serial No.: 10/045,345
	Applicant(s): Derderian et al.	Confirmation No.:
	Filing Date: 25 October 2001	Group: 2818

## OTHER DOCUMENTS (Including Authors, Title, Date, Pertinent Papers, etc.)

Examiner Initial	Copy Enclosed	Document Description
		Anderson et al., "Carborane Complexes of Ruthenium: A Convenient Synthesis of [Ru(CO) <sub>3</sub> (η <sup>5</sup> -7,8-C <sub>2</sub> B <sub>9</sub> H <sub>11</sub> )] and a Study of Reactions of This Complex," <i>Organometallics</i> , 14, 3516-3526 (1995).
		Aoyama et al., "Chemical Vapor Deposition of Ru and Its Application in (Ba,Sr)TiO <sub>3</sub> Capacitors for Future Dynamic Random Access Memories," <i>Jpn. J. Appl. Phys.</i> , 38:2194-2199 (1999).
		Bai et al., "Low-temperature growth and orientational control in RuO <sub>2</sub> thin films by metal-organic chemical vapor deposition", <i>Thin Solid Films</i> , 310, 75-80 (1997).
		Bennett et al., "Mono-olefin Chelate Complexes of Iron(0) and Ruthenium(0) with an Olefinic Tertiary Phosphine," <i>J. Chem. Soc. D.</i> , 7, 341-342 (1971).
		Cowles et al., "Relative Reactivity of Co-ordinated Ligands in the Dienyltricarbonyl-ruthenium Cation, [(dienyl)Ru(CO) <sub>3</sub> ]," <i>Chemical Commun.</i> , 392 (1969).
		Green et al., "Chemical Vapor Deposition of Ruthenium and Ruthenium Dioxide Films," <i>J. Electrochem. Soc.</i> , 132, 2677-2685 (1985).
		Igumenov, "MO CVD of Noble Metals", <i>J. De Physique IV</i> , 5, C5-489-C5-496 (1995).
		Johnson et al., "Chemistry," <i>Nature</i> , 901-902 (1967).
		Kaesz et al., "Low-Temperature Organometallic Chemical Vapor Deposition of Transition Metals," <i>Mat. Res. Soc. Symp. Proc.</i> , 131, 395-400 (1989).
		Kawahara, Takaaki et al., "(Ba, Sr)TiO <sub>3</sub> Films Prepared by Liquid Source Chemical Vapor Deposition on Ru Electrodes," <i>Jpn. J. Appl. Phys.</i> , 35: 4880-4885 (1996).
		Liao et al., "Characterization of RuO <sub>2</sub> thin films deposited on Si by metal-organic chemical vapor deposition," <i>Thin Solid Films</i> , 287, 74-79 (1996).
		Macchioni et al., "Cationic Bis- and Tris(η <sub>2</sub> -(pyrazol-1-yl)methane) Acetyl Complexes of Iron (II) and Ruthenium (II): Synthesis, Characterization, Reactivity, and Interionic Solution Structure by NOESY NMR Spectroscopy," <i>Organometallics</i> , 16, 2139-2145 (1997).

EXAMINER	Date Considered
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INFORMATION DISCLOSURE STATEMENT	Atty. Docket No.: 150.0088 0103	Serial No.: 10/045,345
	Applicant(s): Derderian et al.	Confirmation No.:
	Filing Date: 25 October 2001	Group: 2818

Examiner Initial	Copy Enclosed	Document Description
		Nakamura et al., "Embedded DRAM Technology compatible to the 0.13 $\mu$ m high-speed Logics by using Ru pillars in cell capacitors and peripheral vias," <i>IEEE</i> , (1998).
		Park et al., "Metallorganic Chemical Vapor Deposition of Ru and RuO <sub>2</sub> Using Ruthenocene Precursor and Oxygen Gas," <i>J. Electrochem. Soc.</i> , 147:203-209 (2000).
		Senzaki et al., Chemical Abstract 128:264103, <i>Proc. Electrochem. Soc.</i> , 97-25 (Chemical Vapor Deposition), 933-43 (1997).
		Shin, "Characterization of RuO <sub>2</sub> Thin Films Prepared by Hot-Wall Metallorganic Chemical Vapor Deposition," <i>J. Electrochem. Soc.</i> , 144, 1055 (1997).
		Sosinsky et al., "Hydrocarbon Complexes of Ruthenium. Part IV. Cyclic Dienyl Complexes", <i>J. Chem. Soc.</i> , 16-17, 1633-1640 (1975).
		Takagi et al., "RuO <sub>2</sub> Bottom Electrodes for Ferroelectric (Pb, La)(Zr, Ti)O <sub>3</sub> Thin Films by Metallorganic Chemical Vapor Deposition", <i>Jpn. J. Appl. Phys.</i> , 34, 4104-4107 (1995).
		Versteeg et al., "Metalorganic Chemical Vapor Deposition By Pulsed Liquid Injection Using An Ultrasonic Nozzle: Titanium Dioxide on Sapphire from Titanium (IV) Isopropoxide," <i>Journal of the American Ceramic Society</i> , 78, 2763-2768 (1995).
		Yuan, "Low-Temperature Chemical Vapor Deposition of Ruthenium Dioxide from Ruthenium Tetroxide: A Simple Approach to High-Purity RuO <sub>2</sub> Films," <i>Chem. Mater.</i> , 5, 908 (1993).
		Yang, Doo Young et al., "Characterization of Ru Electrodes for Ru/(Ba,Sr)TiO <sub>3</sub> /Ru Capacitors," <i>Ferroelectrics</i> , 1996. ISAF '96: Proceedings of the Tenth IEEE International Symposium on Applications of Ferroelectrics" New York, NY, August 18, 1996; pgs. 515-518.

EXAMINER	Date Considered
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**COPY**PATENT  
Docket No. 150.00880103IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

Applicant(s): Derderian et al. ) Group Art Unit: 2818  
Serial No.: 10/045,345 ) Examiner: Phuc Dang  
Confirmation No.: 1310 )  
Filed: 25 October 2001 )  
For: METHODS FOR FORMING ROUGH RUTHENIUM-CONTAINING LAYERS  
AND STRUCTURES/METHODS USING SAME

SUPPLEMENTAL INFORMATION DISCLOSURE STATEMENT

Assistant Commissioner for Patents  
P.O. Box 1450  
Alexandria, VA 22313-1450

Sir:

In compliance with the duty imposed by 37 C.F.R. § 1.56, and in accordance with C.F.R. §§ 1.97 *et. seq.*, the materials enclosed herewith are brought to the attention of the Examiner as possibly being of interest in connection with the above-identified patent application. Per M.P.E.P. § 609, the information cited in the present Supplemental Information Disclosure Statement shall not be construed to be an admission that the information is, or is considered to be, material to patentability. Consideration of each of the documents listed on the attached 1449 form is respectfully requested. Pursuant to the provisions of M.P.E.P. §609, Applicants further request that a copy of the 1449 form, marked as being considered and initialed by the Examiner, be returned with the next Official Communication.

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**Supplemental Information Disclosure Statement**

Applicant(s): Derderian et al.

Serial No.: 10/045,345

Confirmation No.: 1310

Filed: 25 October 2001

For: METHODS FOR FORMING ROUGH RUTHENIUM-CONTAINING LAYERS AND  
STRUCTURES/METHODS USING SAME

Page 2 of 2

The Examiner is invited to contact Applicants' Representatives at the below-listed telephone number, if they can be of any assistance during prosecution of the present application.

Respectfully submitted for

**Micron Technology, Inc.**

By

Muetting, Raasch &amp; Gebhardt, P.A.

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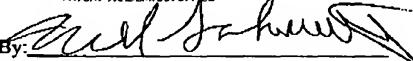
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26813

PATENT TRADEMARK OFFICE

25 JUNE 2003  
DateBy 

Mark J. Gebhardt

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OCT 29 2003

**OFFICIAL**

<b>SUPPLEMENTAL INFORMATION DISCLOSURE STATEMENT</b>	Atty. Docket No.: 150.00880103	Serial No.: 10/045,345
	Applicant(s): Derderian et al.	Confirmation No.: 1310
	Application Filing Date: October 25, 2001	Group: 2818
	Supplemental Information Disclosure Statement mailed: June <u>25</u> , 2003	

**U.S. PATENT DOCUMENTS**

Examiner Initials	Copies Enclosed	Document Number	Date	Name	Class	Subclass	Filing Date If Appropriate
	X	4,953,989	09/04/90	Hooykaas			

**FOREIGN PATENT DOCUMENTS**

Examiner Initials	Copies Enclosed	Document Number	Date	Country	Class	Subclass	Translation Yes	Translation No

**OTHER DOCUMENTS (Including Authors, Title, Date, Pertinent Papers, etc.)**

Examiner Initials	Copies Enclosed	Document Description

<b>EXAMINER</b>	<b>Date Considered</b>
<small>* Examiner: Initial if citation considered, whether or not citation is in conformance with MPEP 609; Draw line through citation if not in conformance and not considered. Include copy of this form with next communication to applicant.</small>	